



# Using a Systems Approach to Project Communications Management

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Senior Systems Engineer

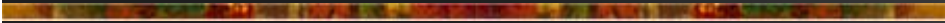
Westar, Aerospace & Defense Group, Inc.

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# Purpose

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- To gain an appreciation of the role of communication management in managing successful projects
- To propose using systems engineering approach to deploy a Project Management Information System (PMIS)



"Where is the wisdom we've lost in  
knowledge? Where is the knowledge  
we've lost in the information?"

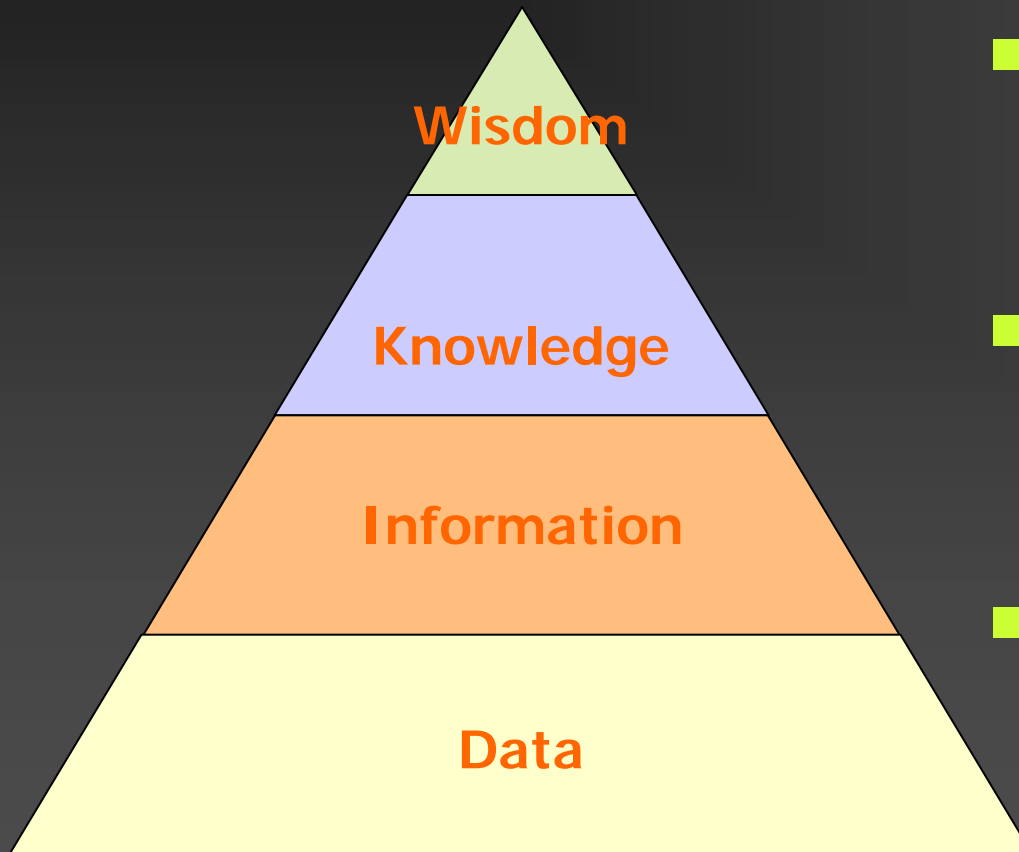
– T.S. Eliott

# Agenda

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- Project Communication Management Overview
- Systems Engineering Process Goals
- Project Hierarchies
- Measurements and Metrics
- Project Management Information Systems (PMIS)
- Communication Planning

# Knowledgeable Decision Making



- Knowledge
  - Communicated information + experience
- Information
  - Patterned data
  - Analysis & structure
- Data
  - Dispersed elements
  - Measurements

# Top 10 Reasons Why Projects Fail?

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- Inadequately trained and/or inexperienced project managers
- Failure to set and manage expectations
- Poor leadership at any and all levels
- Failure to adequately identify, document, and track requirements
- Poor plans and planning processes
- Poor effort estimation
- Cultural and ethical misalignment
- Misalignment between the project team and the business or other organizations it serves
- Inadequate or misused methods
- **Inadequate communication, including progress tracking and reporting**

Source: ganttthead.com, 2003

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# Communication Management

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- PMI® Project Management Body of Knowledge (PMBOK®) Knowledge Area
  - PM Critical Success Factor
    - Provides timely information required for making efficient and effective management decisions
    - Provides mechanism for disseminating management decisions
  - Challenges
    - Timeliness
    - Accuracy
    - Ability to integrate information
-

# Current Situation (Basis of Need)

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- Increase use of web-based applications
- Gov't mandated management initiatives
  - EVMS
  - Risk management
  - Key Performance Parameters (KPPs)
  - etc.
- Various metrics required to status product, process, and progress and proactively control the potential for scope growth



# Definitions

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- System – an integrated set of elements that accomplish a defined objective. These elements include products (hardware, software, firmware), processes, people, information, techniques, facilities, services, and other support elements.
- Systems Engineering – An interdisciplinary approach and means to enable the realization of successful systems.

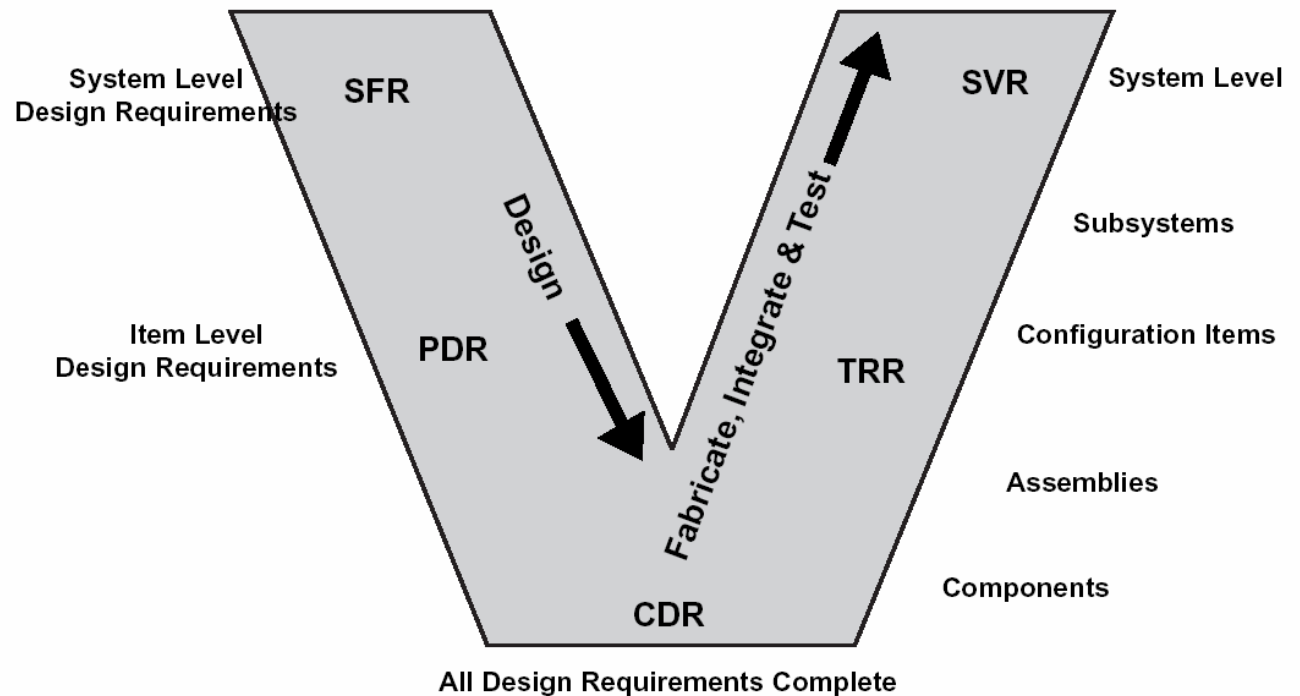
# Systems Engineering Process Goals

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- System decomposition and design
- System integration and verification
- System-of-System integration

# Systems Engineering “Vee” Diagram

- Decompose
- Design
- Integrate
- Verify

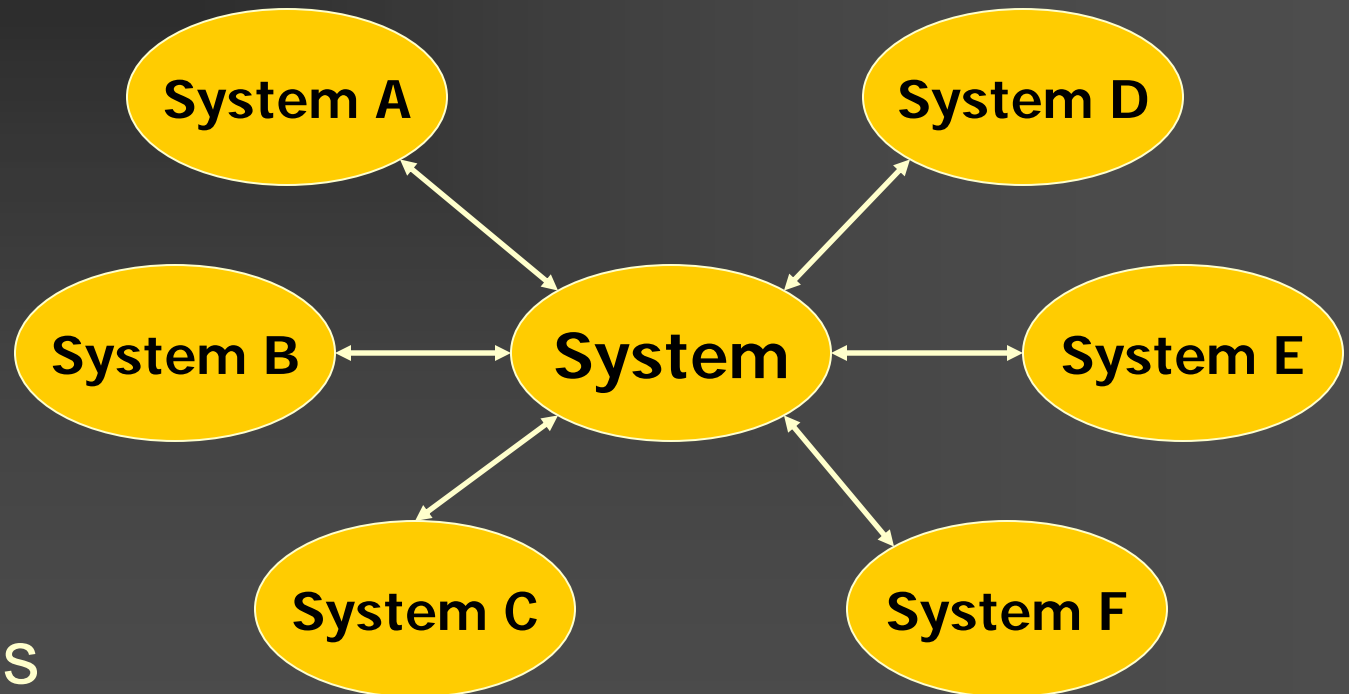


SFR = System Functional Review  
PDR = Preliminary Design Review  
CDR = Critical Design Review

TRR = Test Readiness Review  
SVR = System Verification Review

# System-of-Systems Integration

- Define System Architecture
- Manage Integration through Interface Control Specifications (ICSs)



# Project Hierarchies

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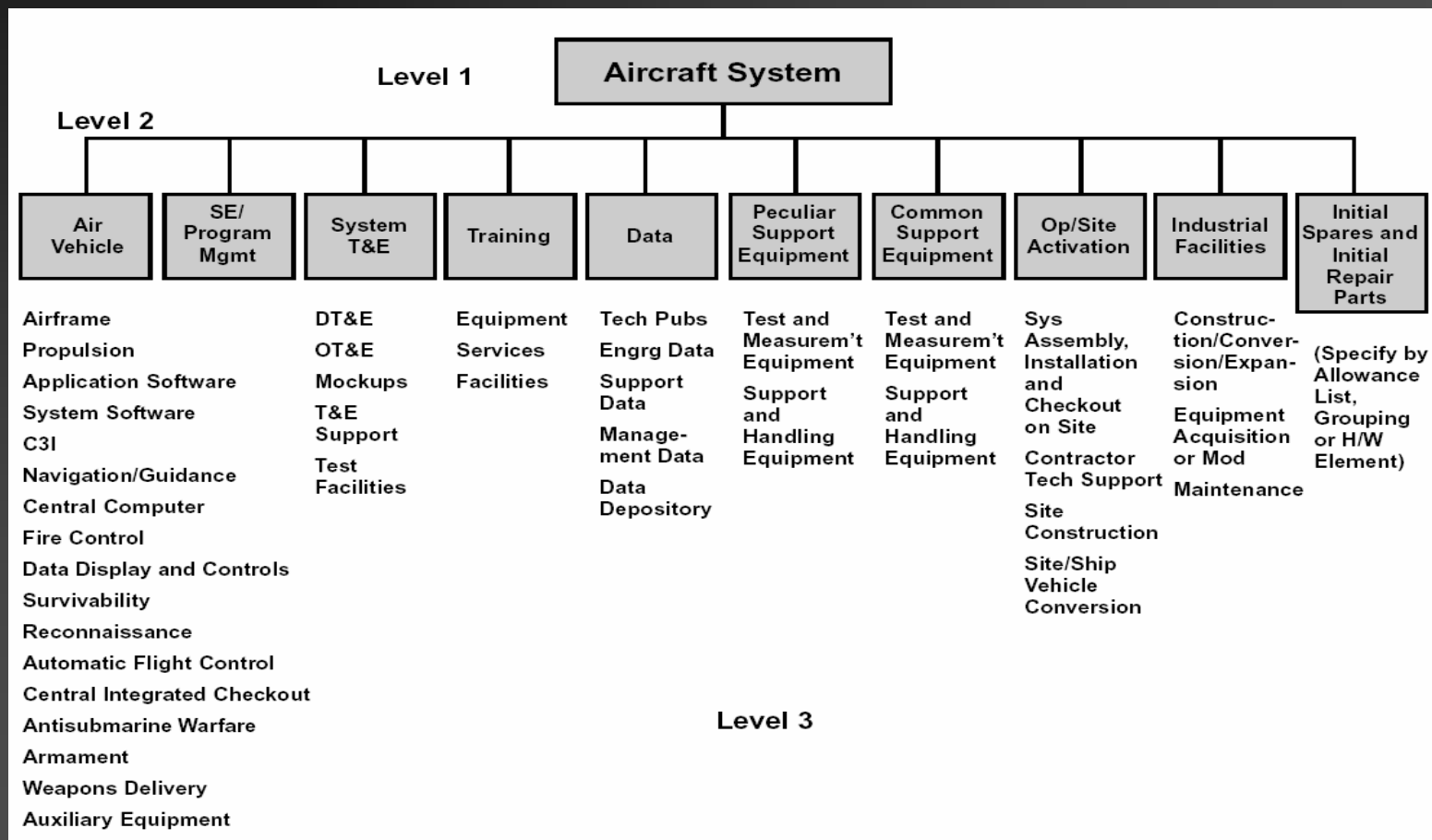
- Product-based Work Breakdown Structure (WBS)
- Product-based Integrated Product Team (IPT) Organization
- Product-based Specifications
- Risk Breakdown Structure

# Project Hierarchies

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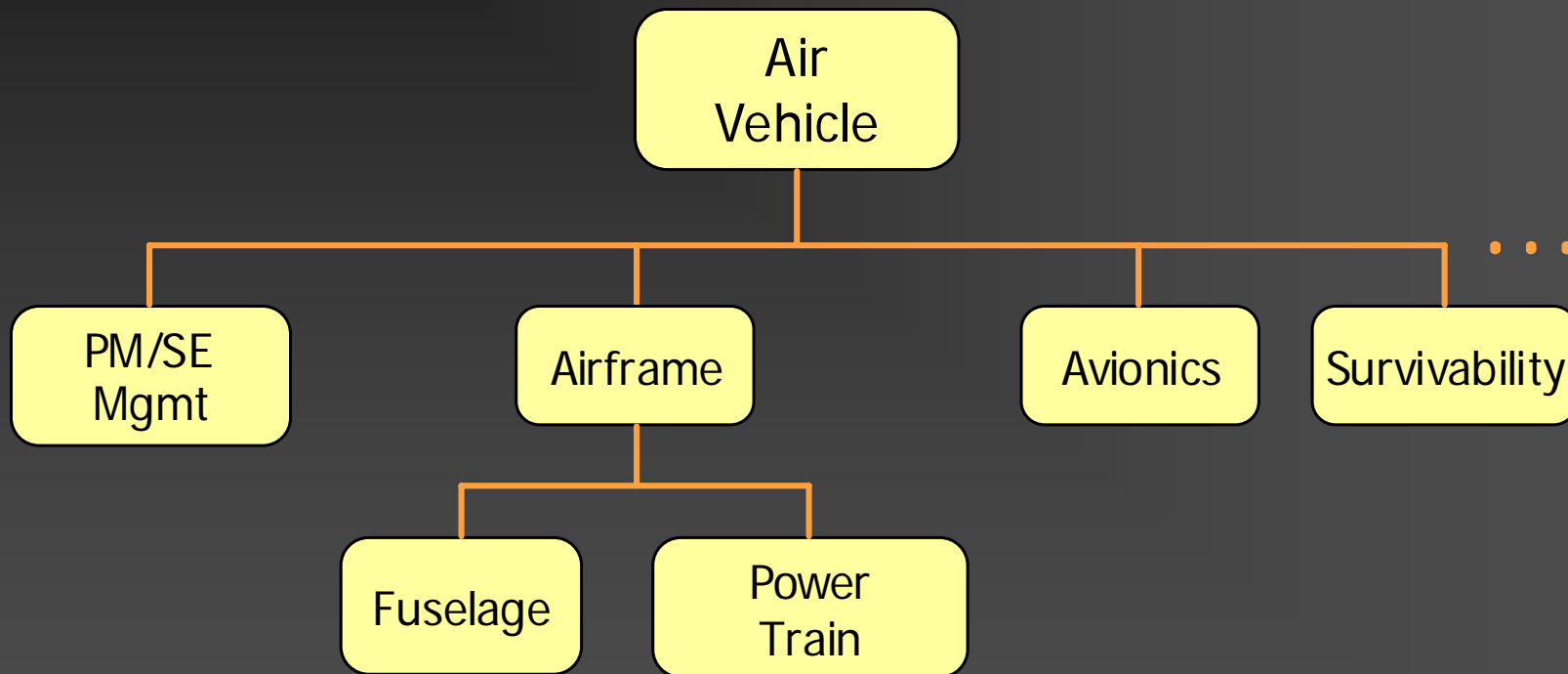
- Work Breakdown Structure (WBS)
  - Derived from project scope
  - Foundation for EVMS implementation
  - Resource loaded to create work packages
  - Work packages for IMP/IMS
  - IBR provides initial assessment of implemented plans
- IPT Organization
  - Product-based
  - Multi-disciplinary

# Aircraft System WBS



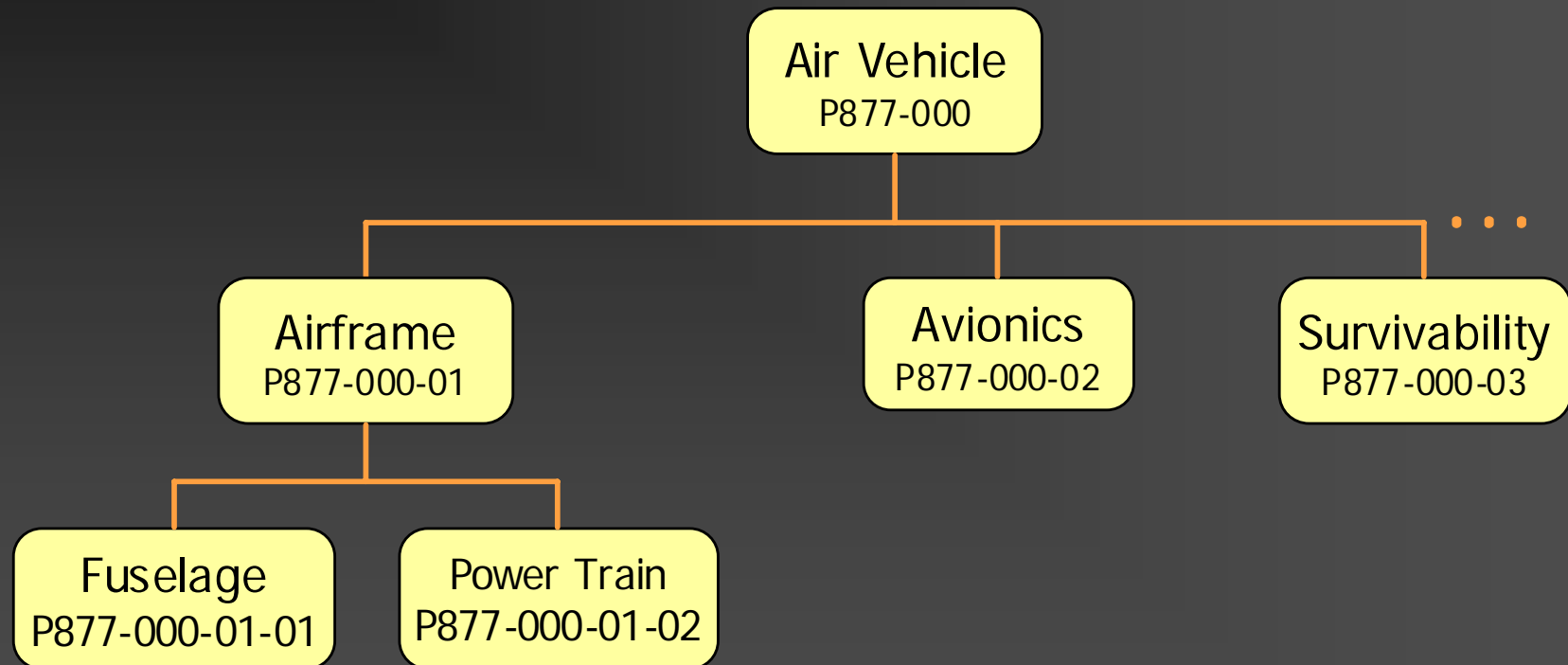
Reference: DoD Work Breakdown Structure (WBS) MIL-HDBK-881

# Aircraft System IPT Organization

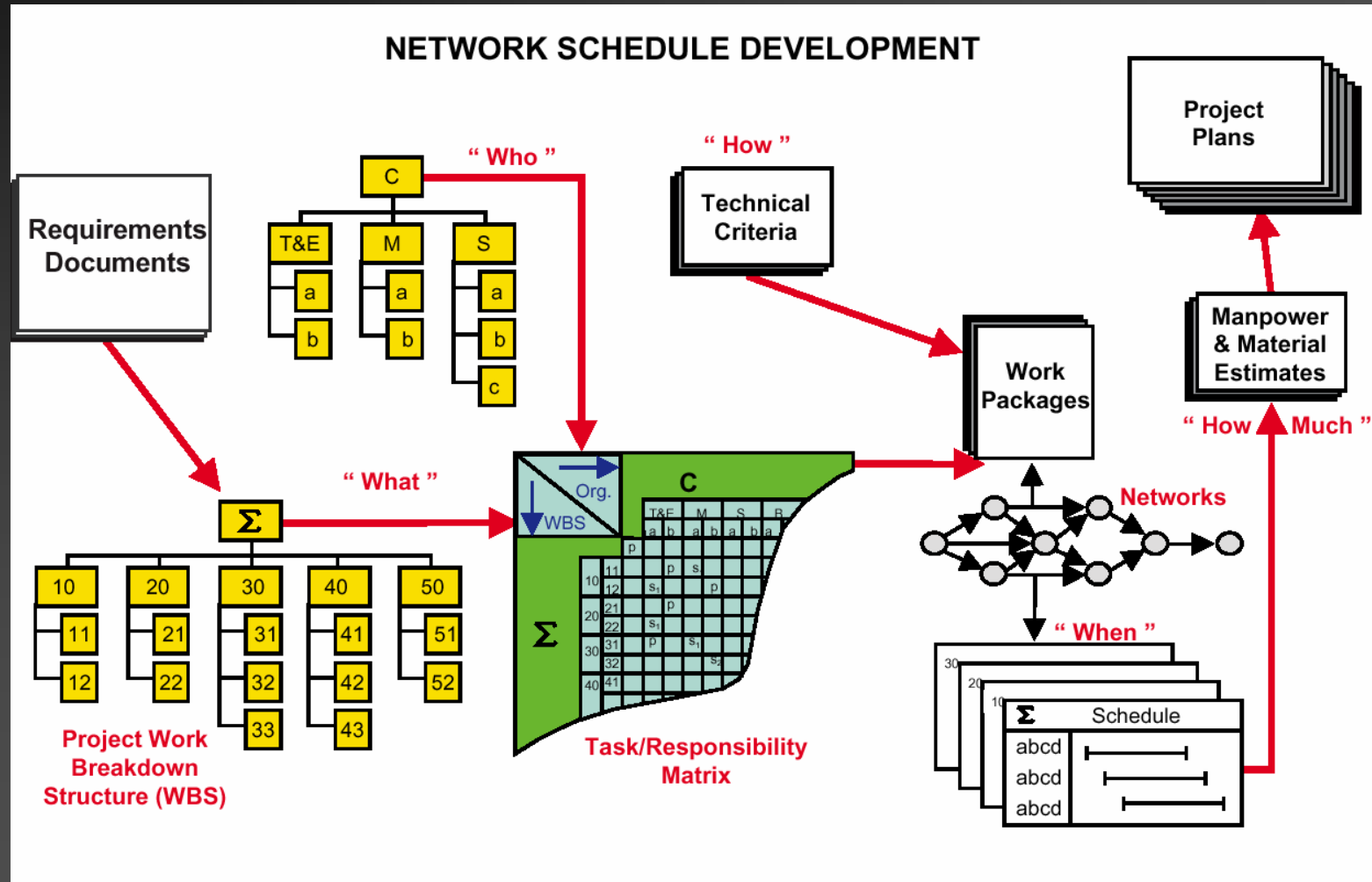




# Air Vehicle Specification Tree



# Network Schedule Development





# Measurements & Metrics

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# Integrating Information Analogy

**“Maintain constant heading & altitude at current power setting”**

1. Constant power
2. Steady altitude
3. Steady heading
4. Steady airspeed
5. VSI steady
6. No sideslip
7. Wings level
8. Steady pitch



# Recovery Response

**“Without adjusting power setting, recover by lowering nose to regain airspeed and descend to desired airspeed and altitude”**

1. Constant power
2. Altitude higher
3. Constant heading
4. VSI - 500 ft/sec rate of climb
5. No sideslip
6. Wings level
7. Nose-up pitch





# Metric

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## ■ Definition

“A measurement taken over a period of time that communicates vital information about a process or activity. A metric should drive appropriate action.”

NASA NPR 7120.5B,  
NASA Program and Project Management Processes and Requirements

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# Measurements & Metrics

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- Lynchpin to making and providing timely, effective, & efficient management decisions and direction
- Management decisions based on information derived from measurement data
- Types of measurements
  - Process
  - Progress
  - Product
- Measurements create data that can be organized to generate hierarchal information

# Metric Attributes

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- Presents useful data to support decision making process
- Sustaining value over time
- Supports desired outcome
- Timely and pertinent to stakeholder(s) at all levels

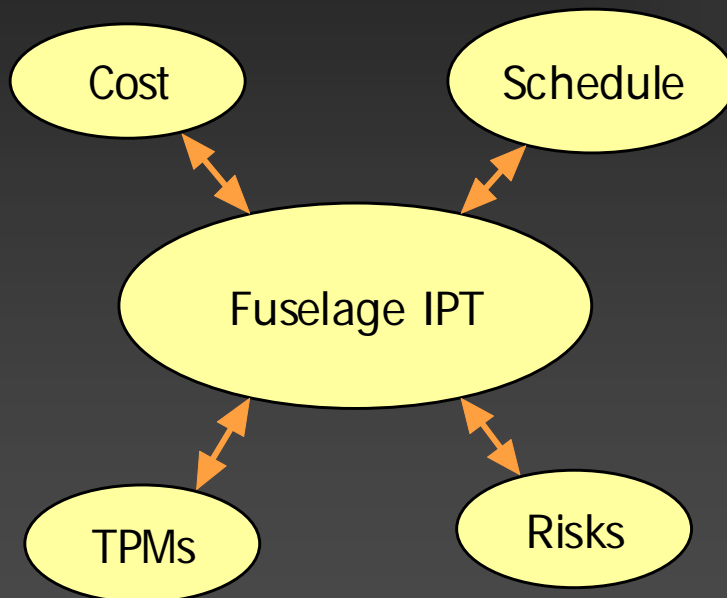


# EVMS is effective because...

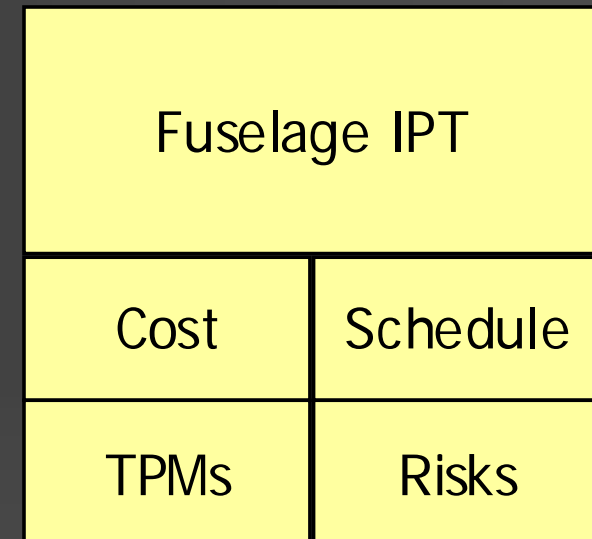
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- System-level Cost Performance Index/Schedule Performance Index (CPI/SPI) is derived from a roll-up of lower level work packages
- Top-level numbers are only as good as the quality of the planning at the lowest levels
- Management has to be effective and efficient at all levels to enhance success

# Integration of Information

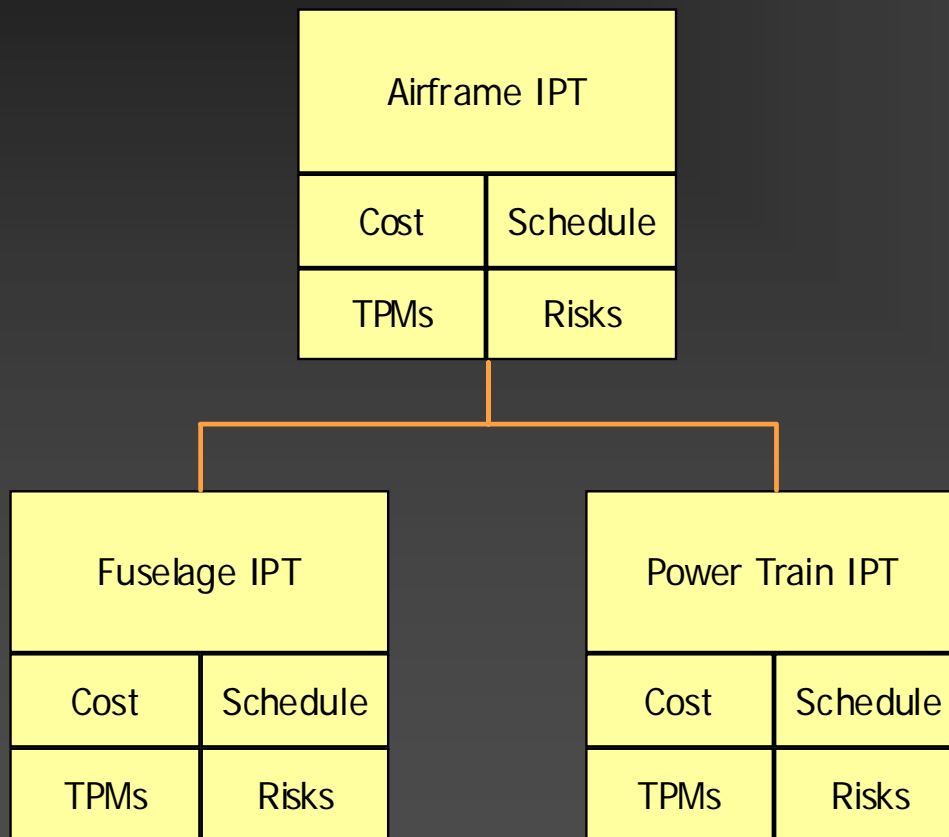


**Integration begins at lowest IPT level**



**Integrated Dashboard Display**

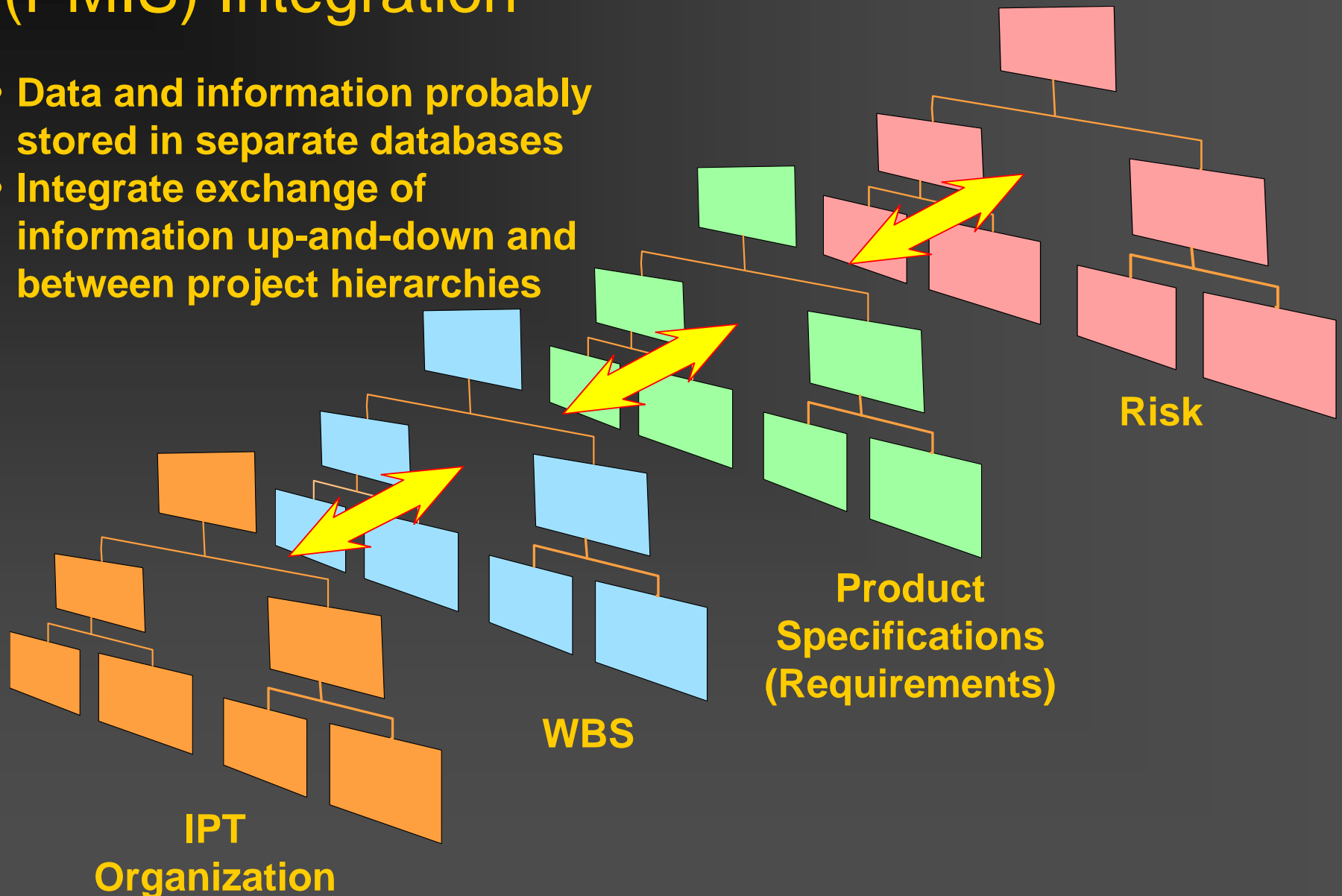
# Linking Information



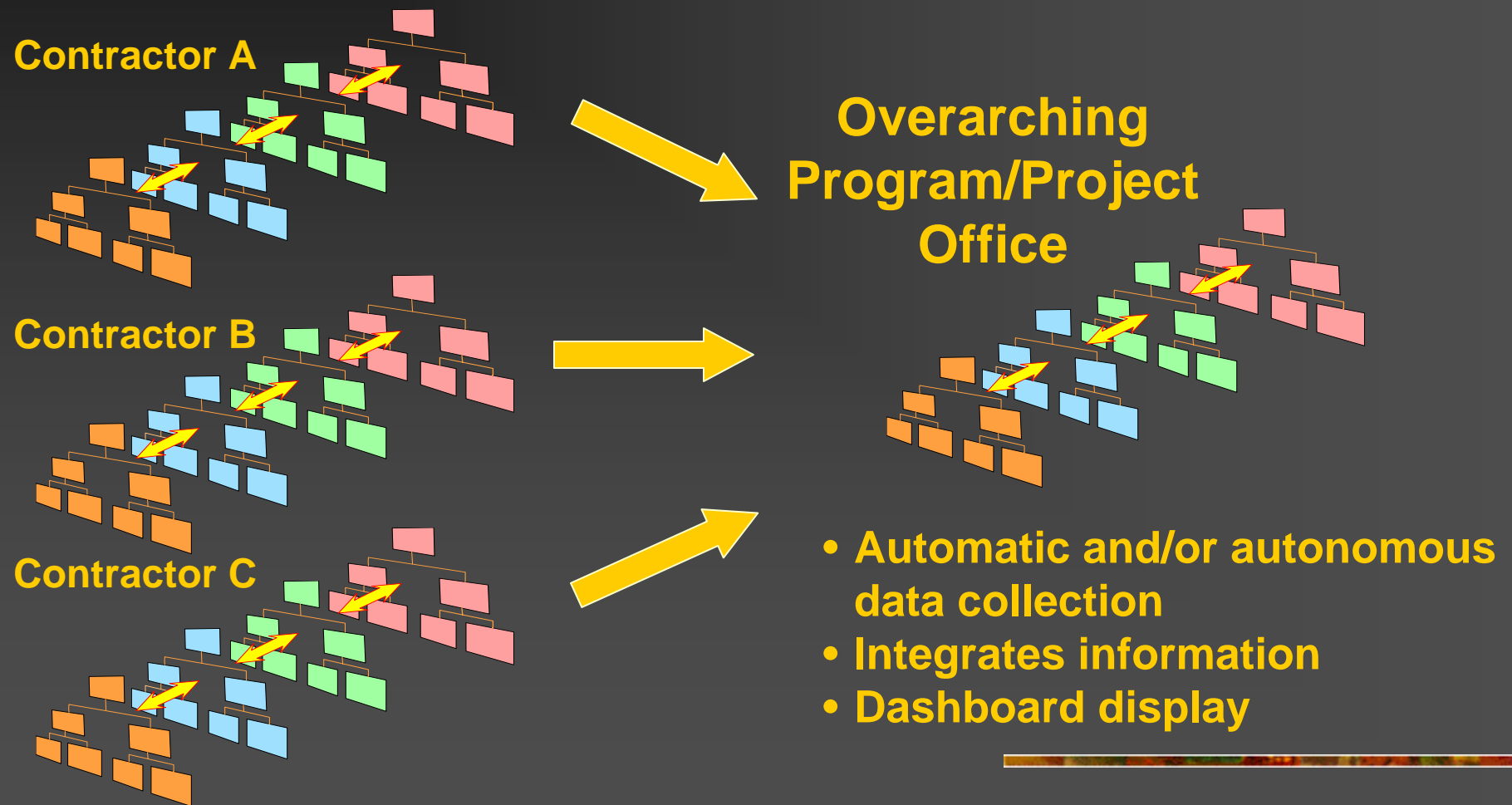
- Airframe Weight
  - TPM
  - Cost
  - Schedule
  - Risks

# Project Management Information System (PMIS) Integration

- Data and information probably stored in separate databases
- Integrate exchange of information up-and-down and between project hierarchies



# System-of-Systems Integration



# Project Management Information System (PMIS)

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- Qualifies as a “System”...an integrated set of elements that accomplish a defined objective
- Command center lay-out
  - Near real-time displays of information
  - Allows corroboration of information
  - Early-warning indicators if exceeding acceptable range of parameters
  - Deploys management decisions
  - Same system provides management decision feedback
- Collects output of specialized software
- Repository of metrics and information normally collected by a program/project



# Program Control System (PCS) Demonstration

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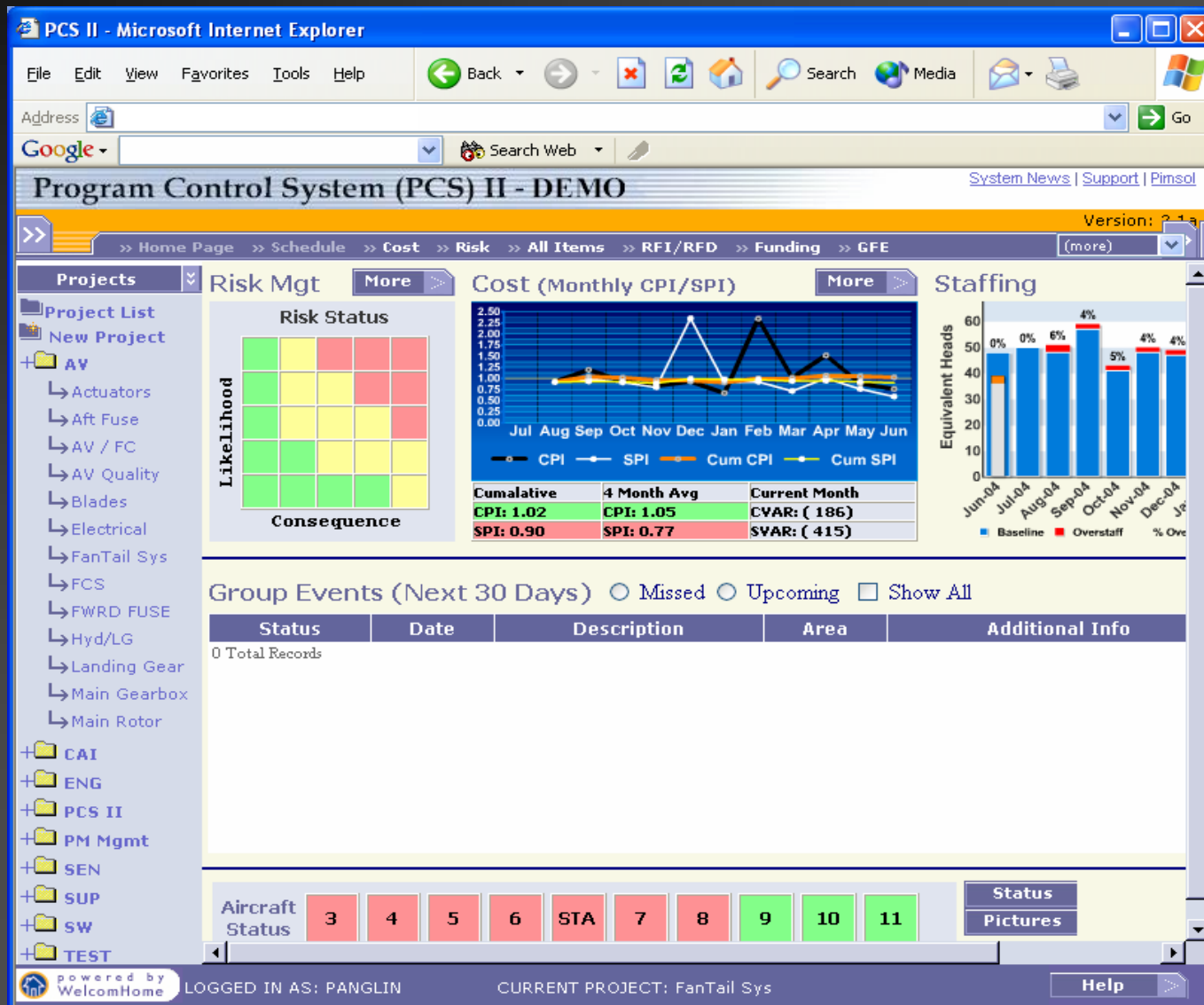
# Program Control System (PCS)

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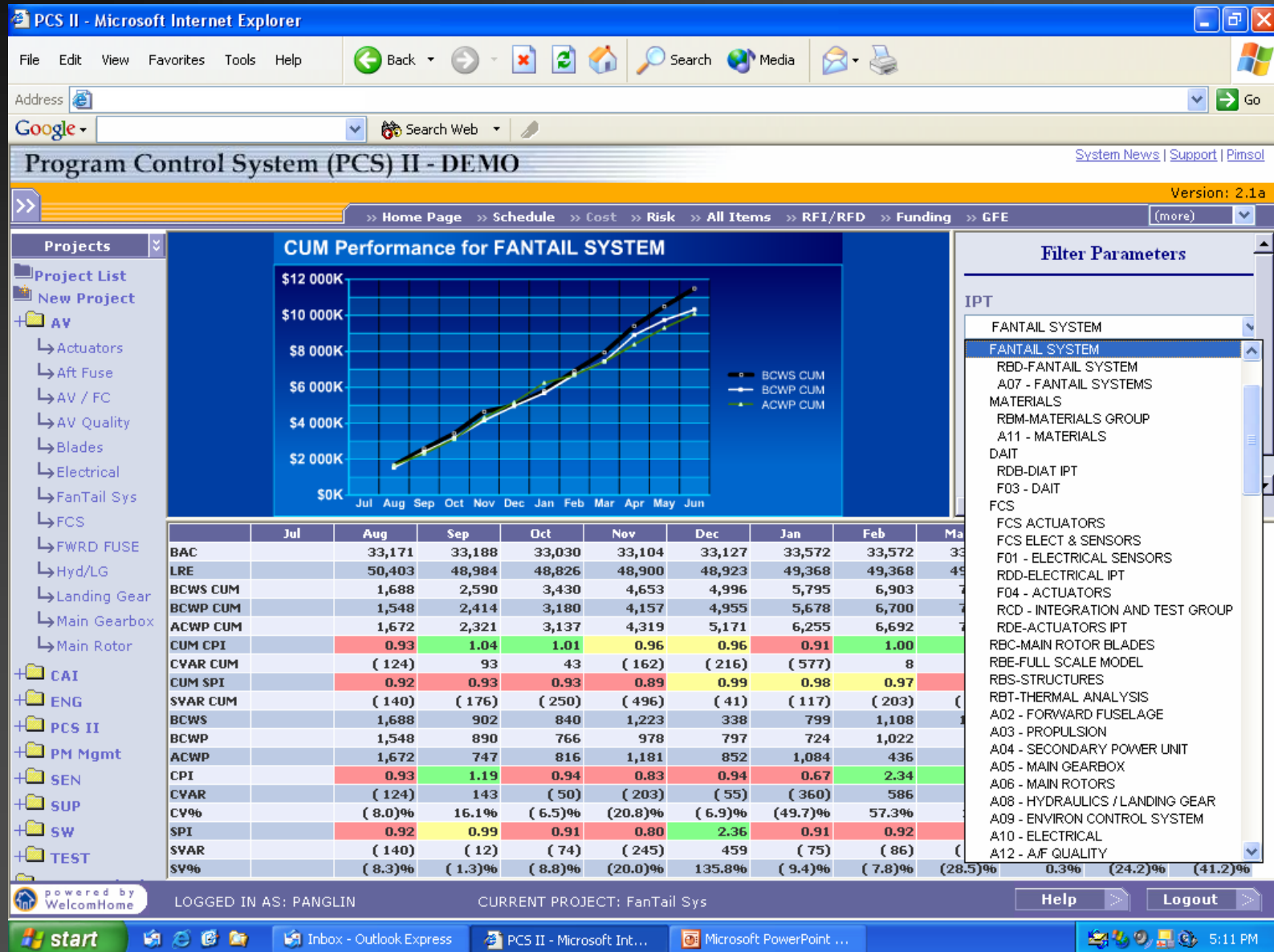
- Combined hierarchal IPT structure and information requirements
- Automated or autonomous data collection
- Dynamic and adaptable
  - Evolving refinement
  - Adapts to Program/Project Phase requirements
- Exception reporting – “only what’s changed”
- Integrates management initiatives & goals



# Program Control System (PCS) IPT Homepage



# IPT Cost Status webpage



# IPT Financial Status webpage

PCS II - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Media

Address [Google](#) Search Web

System News | Support | Pinsol

Program Control System (PCS) II - DEMO

Version: 2.1a

Home Page Schedule Cost Risk All Items RFI/RFD Funding GFE

Projects

- Project List
- New Project
- AV
  - Actuators
  - Aft Fuse
  - AV / FC
  - AV Quality
  - Blades
  - Electrical
  - FanTail Sys
  - FCS
  - FWRD FUSE
  - Hyd/LG
  - Landing Gear
  - Main Gearbox
  - Main Rotor
- CAI
- ENG
- PCS II
- PM Mgmt
- SEN
- SUP
- SW
- TEST

STATUS OF FY 03 FUNDING EXECUTION (\$K As of 30 Jun 03)

PM/DIV	Initial RAC	Adj. RAC	Funded/Comted	OBL	OBL Rate (OBL/RAC)	Spent Amount	Spent Rate (Spt/RAC)
<a href="#">PM AIR VEHICLE</a>	5,536.4	5,954.4	5,953.2	5,878.2	98.72%	3,352.6	56.31%
PM SENSORS	12,875.8	12,440.8	12,029.7	12,029.7	96.70%	6,275.7	50.44%
<a href="#">ARMAMENT</a>	2,981.0	2,792.0	2,555.6	2,555.6	91.53%	1,073.7	38.46%
<a href="#">SENSORS</a>	9,894.8	9,648.8	9,474.1	9,474.1	98.19%	5,202.0	53.91%
<a href="#">PM CAI</a>	1,721.1	911.0	796.0	771.0	84.63%	375.2	41.18%
SYSTEM ENG DIV	5,236.9	5,717.9	5,546.7	5,170.6	90.43%	2,894.1	50.62%
<a href="#">TEST</a>	792.2	909.2	909.0	909.0	99.98%	382.0	42.01%
<a href="#">SED</a>	4,444.7	4,808.7	4,637.7	4,261.6	88.62%	2,512.1	52.24%
<a href="#">SUPPORTABILITY DIV</a>	4,006.1	4,023.6	3,578.3	3,570.3	88.73%	1,829.0	45.46%
<a href="#">GFE</a>	3,106.0	2,276.0	1,320.0	90.0	3.95%	0.0	0.00%
<a href="#">BUSINESS DIV (CONTRACTS/MATRIX)</a>	772,795.6	764,216.3	743,580.3	738,910.3	96.69%	347,247.8	45.44%
BUSINESS DIV (TDY/INHOUSE)	15,623.0	14,436.0	10,906.0	10,906.0	75.55%	10,906.0	75.55%
<a href="#">IN-HOUSE</a>	14,103.0	12,226.0	9,275.0	9,275.0	75.86%		
<a href="#">TDY</a>	1,520.0	2,210.0	1,631.0	1,631.0	73.80%		
<b>TOTAL AV REQUIREMENTS</b>	<b>820,900.9</b>	<b>809,976.0</b>	<b>783,710.2</b>	<b>777,326.1</b>	<b>95.97%</b>	<b>372,880.4</b>	<b>46.04%</b>

Filter Parameters

RAC

R-FORMS

Project

- ☐ 2LT
- ☐ 327
- ☐ C72
- ☐ C79

Form

- ☐ R-2A
- ☐ R-3
- ☐ R-4A

Org Metrics

Support Contracts

Matrix Support

Please Select

powered by WelcomHome

LOGGED IN AS: PANGLIN

CURRENT PROJECT: AV Quality

Help Logout

start

Inbox - Outlook Express

PCS II - Microsoft Int...

Microsoft PowerPoint ...

5:17 PM

# IPT Risk Management Status webpage

PCS II - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address

Google Search Web

Program Control System (PCS) II - DEMO

System News | Support | Pimsol

Version: 2.1a

>> Home Page >> Schedule >> Cost >> Risk >> All Items >> RFI/RFD >> Funding >> GFE (more)

**Projects**

Project List  
New Project

AV

- Actuators
- Aft Fuse
- AV / FC
- AV Quality
- Blades
- Electrical
- FanTail Sys
- FCS
- FWRD FUSE
- Hyd/LG
- Landing Gear
- Main Gearbox
- Main Rotor

CAI

ENG

PCS II

PM Mgmt

SEN

SUP

SW

TEST

**Risk List**

Weeks Late	IPT	Risk ID	Title	Status/Level	L/C Type	Step Description	Date
35	Fwd Fuselage	100028	Seal RCS Performance	MOD 1	3,3 T	Conduct RCS Testing	5/22/04
30	Aft Fuselage	100144	Aft Fuselage - Composite Component Springback	MOD 3	3,3 S/C	Fabricate Critical Process Prover Components	6/28/04
13	Aft Fuselage	100144	Aft Fuselage - Composite Component Springback	MOD 3	3,3 S/C	Develop Assembly Techniques to utilize deformed components	10/21/04
13	Aft Fuselage	100144	Aft Fuselage - Composite Component Springback	MOD 3	3,3 S/C	Redesign Composite Components to Minimize Springback Deformation	10/21/04
	Fwd Fuselage	100024	Exterior Finish Quality	LOW 2	2,3 T	Definition of Uniform Paint Application Technique	1/28/05
	Fwd Fuselage	100028	Seal RCS Performance	MOD 1	3,3 T	Complete Durability Testing	7/29/06

Records 1 thru 6 of 6

**Filter Parameters**

IPT  
Fuselage System

**Assessed Levels**

Level 1 ☒ Level 3 ☒  
Level 2 ☒ Level 4 ☒  
☒ Show All Steps  
Filter

**Risk Status**

Likelihood

		2		
		1		

Consequence

**Delinquent Risk Metrics**

Items by Aging  
Items by IPT  
Weekly Trend

powered by WelcomHome

LOGGED IN AS: PANGLIN

CURRENT PROJECT: AV Quality

Help Logout

start

Inbox - Outlook Express

PCS II - Microsoft Int...

Microsoft PowerPoint ...

5:18 PM

# PMIS Benefits

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- Consistent management process throughout organization
- Standardized reporting
- Develop PM and IPT Lead proficiency
- Central repository
  - Decision making information
  - Management decisions
- Evaluate efficiency & effectiveness of management decisions



# Communication Planning

# Communication Planning

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- Origin in Project Formulation Phase
  - Project Charter
  - Directives Review
  - Stakeholder Analysis
- Communication Management Plan
  - Part of Project Management Plan
  - Covers all forms of communication
  - Defines top level communication requirements
  - Additional detail in lower level management plans

# Communication Planning Process

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- Employ SE process
  - Flow-down & roll-up traceability
  - Integration of project hierarchies
- Measurements & metrics
  - Project status
  - Feedback loops to assess efficiency & effectiveness



# PMIS Requirements

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- Autonomous/automatic data harvesting
- Integrates data
  - Horizontally
  - Vertically
- Corroborates information
- Synchronizes information
- Color coding
- Standard management reports

# Metric Profile

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- Metric Title
  - Metric Description
    - Type...progress, product, or process
    - Derivation from program/project goals & objectives
    - Uses
  - Responsible Organization
  - Measurement inputs & constraints
  - Start/End dates
  - Timeliness...or when is data no longer useful
  - Frequency...or how often is measurement taken
  - Automatic or autonomous collection
  - Metric output – where does it go?
-

# Communication “System”

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- Communication requirements associated with every project
- Process, progress, & product metrics
- Traceability through flow-down & verification (rollup)
- Integrate information to create dashboards for a particular level of management
- Communicate management decisions and associated impact(s)

# Summary

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- Greater emphasis on communications and measurement planning during program/project formulation phase
  - Enhance management decision-making process
  - Employ Systems Engineering techniques
    - Structured process in making complex management decisions
    - “Things either flow-down or roll-up” to ensure traceability and verifiability
    - Integration of systems at all levels to exchange information
-